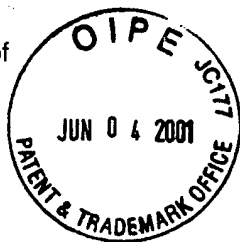


IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
Before the Board of Patent Appeals and Interferences

In re Patent Application of  
JOHNSON  
Serial No. 09/048,838  
Filed: March 27, 1998



Atty. Dkt. 540-113  
C#/M#  
Group Art Unit: 3644  
Examiner: J. Eldred  
Date: June 4, 2001

Title: FAIRING ARRANGEMENTS FOR AIRCRAFT

Assistant Commissioner for Patents  
Washington, DC 20231

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JUN 07 2001

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Sir:

☐ **NOTICE OF APPEAL**

Applicant hereby appeals to the Board of Appeals from the decision dated \_\_\_\_\_ of the Examiner twice/finally rejecting claims \_\_\_\_\_ (\$ 310.00 )

\$ 0.00

☒ An appeal **BRIEF** is attached in triplicate in the pending appeal of the above-identified application (\$ 310.00)

\$ 310.00

☐ An **ORAL HEARING** is requested under Rule 194 (\$270.00) (due within two months after Examiner's Answer)

\$ 0.00

☐ Credit for fees paid in prior appeal without decision on merits

-\$ ( 0.00)

☒ A reply brief is attached in triplicate under Rule 193(b)

(no fee)

☐ Petition is hereby made to extend the current due date so as to cover the filing date of this paper and attachment(s) (\$110.00/1 month; \$390.00/2 months; \$890.00/3 months; \$1390.00/4 months)

\$ 0.00

**SUBTOTAL** \$ 310.00

☐ This application is entitled to "Small entity" status; enter 1/2 of subtotal and subtract

-\$ ( 0.00)

☐ "Small entity" statement attached.

**SUBTOTAL** \$ 310.00

Less month extension previously paid on

-\$ ( 0.00)

**TOTAL FEE ENCLOSED** \$ 310.00

Any future submission requiring an extension of time is hereby stated to include a petition for such time extension. The Commissioner is hereby authorized to charge any deficiency in the fee(s) filed, or asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our **Account No. 14-1140**. A duplicate copy of this sheet is attached.

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By Atty.: Stanley C. Spooner, Reg. No. 27,393

Signature: \_\_\_\_\_

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

**JOHNSON**

Serial No. 09/048,838

Filed: March 27, 1998

For: **FAIRING ARRANGEMENT FOR  
AIRCRAFT**



Atty. Ref.: 540-113

Group: 3644

Examiner: J. Elred

\*\*\*\*\*

**APPEAL BRIEF**

On Appeal From Group Art Unit 3644

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**TABLE OF CONTENTS**

I. REAL PARTY IN INTEREST.....	1
II. RELATED APPEALS AND INTERFERENCES .....	1
III. STATUS OF CLAIMS .....	1
IV. STATUS OF AMENDMENTS .....	1
V. SUMMARY OF THE INVENTION .....	2
VI. ISSUES .....	4
VII. GROUPING OF CLAIMS .....	5
VIII. ARGUMENT .....	5
1. Discussion of the References.....	5
2. Discussion of the Rejections.....	7
3. The Errors in the Final Rejection.....	8
(a) The Examiner either misconstrues claimed elements or fails to point to the existence of such elements and claimed interrelationships among elements in the cited prior art.....	9
(1) The claimed "rubber or rubber-like material" .....	9
(2) There is still no disclosure of the claimed "sheet element" in the prior art references.....	10
(b) The Examiner fails to provide any motivation for combining prior art references .....	13
(c) The Examiner fails to rebut appellant's evidence of unexpected result in the claimed invention.....	15
IX. CONCLUSION.....	18
APPENDIX A .....	A1

### **I. REAL PARTY IN INTEREST**

The real party in interest in the above-identified appeal is BAE SYSTEMS plc by virtue of the Assignment from the inventor to British Aerospace Public Limited Company recorded June 19, 1998, at Reel 9290, Frame 0582, and a name change from British Aerospace Public Limited Company to BAE SYSTEMS plc recorded October 12, 2000, at Reel 11195, Frame 0065.

### **II. RELATED APPEALS AND INTERFERENCES**

Although appellant previously noted an appeal on December 14, 1999, the Patent Office withdrew the then outstanding Official Action and ultimately issued a further Official Action. Thus, there are believed to be no related appeals or interferences with respect to the present application and appeal.

### **III. STATUS OF CLAIMS**

Claims 1-10 and 13-17 stand rejected, with claims 11 and 12 withdrawn from consideration. The Examiner contends that claims 1-10 and 13-17 are unpatentable as obvious in view of the combination of the two prior art references Williams and Shine.

### **IV. STATUS OF AMENDMENTS**

On September 14, 1999 (Paper No. 12), the Patent Office finally rejected claims 1-10 and 13-17 as being anticipated by the Williams et al patent. On

December 9, 1999, a telephone interview was conducted between Supervisory Patent Examiner Michael Carone and appellant's undersigned representative. In the Interview Summary prepared by the SPE Carone (Paper No. 13), the Examiner confirmed that the previous Final Rejection would be withdrawn in view of the fact that "the examiner did not address elements in claim 1 regarding the composite sheet elements."

In an abundance of caution and to maintain the application, appellant filed a Notice of Appeal on December 14, 1999. In spite of this, appellant received a Notice of Abandonment mailed July 25, 2000 (Paper No. 15), which was subsequently withdrawn in Paper No. 16 mailed August 3, 2000. The present non-final Official Action was mailed January 4, 2001 (Paper No. 17), and while changing the rejection from §102 to §103 and adding an additional prior art reference, the Examiner still refuses to address the claim 1 limitation of a "composite sheet element." No additional amendments have been offered and the rejection set out in the Official Action mailed January 4, 2001 (Paper No. 17) remains in force.

#### **V. SUMMARY OF THE INVENTION**

The present invention relates to the problem of sealing aircraft control surfaces. Specifically, the movable control surfaces, such as elevators, ailerons, rudders, etc., are generally made of metal and pivotally mounted in conjunction

with the fixed flight surfaces. To increase or decrease lift on a wing, elevator or rudder, the control surface is moved, thereby changing the overall lift on that aircraft component allowing the aircraft to be banked in the case of ailerons, pitched up in the case of an elevator and/or yawed in the case of the rudder. The passage of air through the necessary gaps between the control surface and the fixed surface reduces the effectiveness of the control surface and increases drag on the aircraft.

In the past, attempts to close these gaps and prevent airflow therebetween were characterized by the use of a plurality of flexible steel fingers coated with a low friction material, which bridged the gap and were sufficiently flexible to conform with the position of the control element as it moved. One such embodiment is disclosed in U.S. Patent 5,071,092 issued to Williams et al and assigned to the assignee of the present application. As noted in the Background of the Invention portion of the present application (page 3, lines 7-17), such fairing arrangements were found to have relatively short life, were relatively complicated and thus expensive to manufacture.

The applicant of the present invention found that, contrary to conventional wisdom, a single element would not be able to withstand the range of movements required while displaying sufficient resilience, and that, in fact, a composite element made of rubber or rubber-like material incorporating a plurality of

reinforcing plies will meet the requirements and yet will be easier to manufacture and have longer life than previously known fairings.

Specifically, the appellant found that the use of a flexible seal member having a proximal edge fixed relative to one of the fairing portions and a distal edge so that the seal member "defines a surface which generally conforms to the adjacent portions of said first and second fairing portions" provides the desired air gap seal, and yet at the same time, is easily manufactured and is extremely durable.

Thus, features of the present invention solving the problem of low cost durable fairings between fixed and movable control surfaces comprise **"a flexible seal member"** which is made up of a **"composite sheet element"** of **"rubber or rubber-like material"** incorporating **"a plurality of reinforcing plies"** where the seal member **"defines a surface which generally conforms to the adjacent portions of said first and second fairing portions."**

## VI. ISSUES

Whether claims 1-10 and 13-17 are indefinite under 35 USC §112 (second paragraph).

Whether claims 1-10 and 13-17 are obvious under 35 USC §103 over Williams in view of Shine.

## **VII. GROUPING OF CLAIMS**

The rejected claims do not stand or fall together and are specifically discussed as distinguishing over the prior art in the argument portion of this Appeal Brief.

## **VIII. ARGUMENT**

### **1. Discussion of the References**

Williams et al (U.S. Patent 5,071,092) is exemplary of the prior art referred to in appellant's specification and is assigned to British Aerospace plc, the predecessor name of the assignee of the current application, BAE SYSTEMS plc.

Williams teaches the sort of overlapping flexible steel fingers arrangement discussed in appellant's specification at page 3, lines 3-17. A plurality of flexible steel "fingers" are arranged in overlapping layers so as to form a fairing arrangement which bridges the surface of the fixed aircraft structure and the control surface. The fingers are coated with a low friction material, such as Teflon, and the steel fingers may be preloaded so as to maintain the assembly in cross-sectional conformity with the fixed fairing.

There does not appear to be any disclosure that the flexible seal assembly in Williams comprises a composite sheet element. There is no disclosure that the flexible seal member includes "rubber or rubber-like material." There is no disclosure that the flexible seal member includes "a plurality of reinforcing plies

across at least part of the sheet element" and while there is a disclosure that the steel fingers maintain the assembly in cross-sectional conformity "with the fixed fairing," there is no disclosure that it conforms "to the adjacent portions of" both the fixed and movable fairing portions.

**Shine (U.S. Patent 5,156,360)** teaches a prior art cowl edge which generally underlies another portion of an engine cowl. In order to prevent damage when the cowl with the overlapping cowl edge is closed prior to the adjacent cowl, the cowl edge is comprised of portion of a flexible seal strip which is shown in Figures 2 and 5.

Shine does not disclose and is not related to any fairing arrangement "for bridging an aircraft fixed structure and a control surface hingedly mounted on and angularly displaceable with respect to said aircraft structure. As a result, Shine does not teach an intermediate flexible seal member which is disposed on one of a first or second fairing portion, nor does it bridge a fixed aircraft structure and an aircraft control surface. Shine does not disclose a surface which "generally conforms to the adjacent portions of said first and second fairing portions" especially where the control surface fairing portion is "angularly displaceable with respect to said aircraft structure."

Shine merely discloses a flexible seal which extends out from a portion of the cowl to close the gap between the cowl and an adjacent cowl. The

flexible strip is a substitute for the original metal cowling edge so as to prevent damage to the edge when the cowlings are not closed in the proper order. The flexible seal can be deflected out of the way permitting an adjacent cowl to be closed after the closing of the cowl mounting the sealing strip.

## **2. Discussion of the Rejections**

Claims 1-10 and 13-17 stand rejected under 35 USC §112 (second paragraph) as being indefinite. Specifically, the Examiner alleges that the phrase "rubber or lubber[sic]-like is alternative and indefinite." The Examiner specifically notes that "'rubber-like' is unclear as to what characteristics are being claimed as limitations."

Claims 1-10 and 13-17 stand rejected under 35 USC §103 as unpatentable over Williams in view of Shine. To the extent it is understood, the Examiner appears to treat Williams in precisely the same manner as the Official Action mailed on September 14, 1999, which was retracted by the PTO in accordance with the comments of SPE Carone on December 9, 1999 (Interview Summary, Paper No. 13), the supervisory noting that "the examiner did not address elements in claim 1 regarding the composite sheet elements."

The Examiner does include a further admission that "Williams et al fail to show one of the plies comprising a fabric material." The Shine reference is apparently cited to show that it is known to use plies of rubber and fabric "to form

aircraft seals." The Examiner apparently concludes that it would be considered obvious to combine the Shine teachings with that disclosed in the Williams patent.

The Examiner does not indicate any basis or reason for combining these two references or for disregarding the specific "finger" teachings in the Williams reference. Moreover, the Examiner does not point to any portion of Williams or Shine which establishes any recognition of the problems solved by the present invention or any indication that a combination of these references would solve the problems noted in the background of the invention portion of this application.

### **3. The Errors in the Final Rejection**

There are at least three significant errors in the Final Rejection and they are summarized as follows:

- (a) The Examiner either misconstrues claimed elements or fails to point to the existence of such elements and claimed interrelationships among elements in the cited prior art;
- (b) The Examiner fails to provide any motivation for combining prior art references; and
- (c) The Examiner fails to rebut appellant's evidence of unexpected result in the claimed invention.

**(a) The Examiner either misconstrues claimed elements or fails to point to the existence of such elements and claimed interrelationships among elements in the cited prior art**

A detailed review of appellant's claim will point out numerous structures and structural interrelationships which the Examiner has either misconstrued or which are clearly absent from the cited prior art references.

**(1) The claimed "rubber or rubber-like material"**

The Examiner alleges that the reference to "rubber or rubber-like material" renders appellant's independent claim indefinite under 35 USC §112. It is not certain whether it is the reference to "rubber-like" which is the primary cause of the alleged indefiniteness or whether it is the use of the alternative "or" in appellant's claim. As a result, both will be treated in this response.

The phrase "rubber-like" is a well-known descriptive term used in the aerospace engineering art. In fact, this term is in such conventional use that it appears in *Webster's Ninth New Collegiate Dictionary* (see page 1028 for the definition of "rubber-like" which is "resembling rubber esp. in physical properties (as elasticity and toughness)," a copy of which is attached). Inasmuch as the phrase "rubber-like" is well known to those of ordinary skill in the art, there can be no indefiniteness and, therefore, no basis for a rejection that appellant's independent claims include this limitation are therefore indefinite.

To the extent the Examiner is objecting to the use of the word "or," it is noted that the Manual of Patent Examining Procedure (MPEP) Section 2173.05(b) clearly states that "alternative expressions using 'or' are acceptable" and gives as an example "iron, steel or any other magnetic material." Moreover, the MPEP specifies in subsection (a), that "alternative expressions are permitted if they present no uncertainty or ambiguity with respect to the question of scope or clarity of the claims." The term "rubber" is also defined (on page 1028 of *Webster's Ninth New Collegiate Dictionary*) as "any of various synthetic rubberlike substances" and this, combined with the definition of "rubber-like" clearly indicates that rubber and rubber-like have similar, if not identical, claim scope.

Thus, should the Examiner's rejection based upon §112 have been based upon either of the above aspects of the independent claim language, there is no legal basis for such a rejection and is clear error on the part of the Examiner.

**(2) There is still no disclosure of the claimed "sheet element" in the prior art references**

As noted above, the Final Rejection mailed September 14, 1999 (Paper No. 12) was withdrawn by Supervisory Patent Examiner Michael Carone, because "the examiner did not address elements in claim 1 regarding the composite sheet element." (Interview Summary mailed December 13, 1999 (Paper No. 13)). Notwithstanding this, the present non-final rejection contains an identical *verbatim*

copy of the discussion of the Williams patent (with the exception of the last and summary line). It would appear that the Examiner has merely cut and pasted the paragraph from the improper Final Rejection into this latest Official Action.

Appellant has previously requested the Patent Office to demonstrate where either cited prior art reference discloses a "composite sheet element" as claimed in appellant's independent claims. Specifically, the composite sheet element must be comprised of "rubber or rubber-like material." This is clearly not present in the Williams patent, and the Shine patent, while disclosing rubber or rubber-like material, does not disclose a "composite sheet element." At best, Shine merely discloses a rubber seal which is "sufficiently flexible so as to not impede passage of the overlapping edge portion (11) through the cut-out region (22)" (Abstract, last sentence).

More importantly, neither reference discloses a composite sheet element which "defines a surface which generally conforms to the adjacent portions of said first and second fairing portions." While Williams is concerned with first and second fairing portions, there is no composite sheet element and Shine, while teaching a rubber or rubber-like material with reinforcing plies, teaches this only as a seal which does not conform to the adjacent portions of first and second fairing portions. In fact, as can be seen in the Shine reference, Figures 2 and 5, the seal can be moved to either side of cowl 3 and thus the seal does not conform to the

adjacent portions of the first and second fairing portions, especially when the cowl is displaced. Moreover, the cowl in Shine is not "angularly displaceable" with respect to the aircraft structure.

As a result of the above, it is clear that neither prior art reference discloses the claimed "composite sheet element." The Court of Appeals for the Federal Circuit has held that "the PTO has the burden under §103 to establish a *prima facie* case of obviousness." *In re Fine*, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). The Court went on to say that the PTO can "satisfy this burden only by showing some objective teaching in the prior art. . . ." *Id.* Because the Examiner has failed to show the existence of the claimed "composite sheet element" in either one of the cited prior art references, the Examiner has failed to meet the burden to establish a *prima facie* case of obviousness and the rejection thereunder is clearly erroneous.

In view of the above, the Examiner's errors in misconstruing the well-known term "rubber-like" and in failing to point out where any prior art reference teaches the claimed "composite sheet element," the Patent Office has clearly failed to establish that the structures and structural interrelationships of appellant's independent claims are at all known in the art.

**(b) The Examiner fails to provide any motivation for combining prior art references**

The examiner admits in his rejection that the Williams reference fails to show "one of the plies comprising a fabric material." While this admission is appreciated, in fact Williams does not show the existence of any plies of material, nor does it disclose any of the claimed "rubber or rubber-like material." As noted above, Shine teaches a rubberized fabric material utilized as a seal to the edge of a cowl, but does not teach anything relating to a fairing arrangement for bridging a fixed structure and a control surface, particularly when the control surface is angularly displaceable with respect to the aircraft structure.

The Court of Appeals for the Federal Circuit has recently held in the case of *In re Rouffet*, 47 USPQ2d 1453, 1457-8 (Fed. Cir. 1998) that

"to prevent the use of hindsight based on the invention to defeat patentability of the invention, this court **requires** the examiner to show a motivation to combine the references that create the case of obviousness. In other words, **the Examiner must show reasons** that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed." (emphasis added).

In the present case, while the Williams reference is clearly pertinent prior art in that it deals with a fairing arrangement, it clearly is not aware of the problems of such prior art fairing arrangements, especially as discussed in appellant's specification at page 3, lines 3-17. The problems of relatively short life

of metal finger arrangements, the complicated seals resulting therefrom and the expensive manufacture are all significant problems for the Williams type fairing arrangement. There is clearly no recognition in Williams of any problem, nor is there any suggestion of any reason for looking to other structures and structural arrangements in order to solve that problem.

In the Shine reference, there is clearly no recognition of any problem with fairing arrangements, because Shine has absolutely nothing to do with a fairing arrangement, or with an aircraft fixed structure and a control surface hingedly mounted on the fixed structure, or a control structure which is angularly displaceable with respect to the aircraft structure.

The burden on the Examiner is to show how or why one of ordinary skill in the art, in the absence of any teaching or suggestion of the problem being addressed in either Williams or Shine, that nevertheless one of ordinary skill in the art would take the concept of a fairing arrangement as disclosed in Williams, ignoring the teaching in Williams of using overlapping metal fingers to provide the appropriate fairing arrangement, and instead somehow provide a composite sheet element of rubber or rubber-like material with reinforcing plies to define a surface which generally conforms to the adjacent portions of the fairing portions which are relatively movable with each other.

The Examiner suggests that the motivation for making these changes is contained in the Shine reference which teaches a seal, which in fact is merely a flexible extension of the edge of the cowling (see Shine's Figures 11 and 13 showing the standard metal edge to the cowling and Figures 1, 2 and 5 showing the flexible edge to the metal cowling which allows the cowlings to be closed out of sequence without damage).

The Examiner has provided no reason why one would ignore the teachings of Williams, ignore the teachings in Shine and instead of the metal fingers, Teflon coatings and other structures recited in Williams, would use a rubber-like material in combination with a plurality of reinforcing plies to define a surface that conforms to the adjacent portions of the first and second fairing portions as in appellant's claimed invention.

The Examiner has simply failed to meet his burden under the applicable Court precedent and any further rejection of claims 1-10 and 13-17 over the Williams/Shine combination is clear error.

**(c) The Examiner fails to rebut appellant's evidence of unexpected result in the claimed invention**

The Court of Appeals for the Federal Circuit has also held that it is "error to find obviousness where references diverge from and teach away from the invention at hand." *In re Fine*, at 1599. As noted above, both the Williams and

Shine references teach away from the present combination and require one of ordinary skill in the art to ignore the specific teachings of the multiple fingers in Williams and the lack of a composite sheet element in Shine.

Appellant's specification, after noting the existence of problems with the Williams type fairing arrangement, provides evidence that the inventor was surprised when he found that a "rubber or rubber-like" fairing arrangement could solve the above-discussed problems (page 4, first paragraph). Even assuming that elements taken from the Williams references could be combined in the manner of appellant's claims, the present specification is evidence of record of unexpected result.

At no point during the prosecution of this application has the Examiner disputed or otherwise cast doubt upon the evidence of this unexpected result. As a result, the Examiner cannot now be heard to say that there is no unexpected result. Because there is an unexpected benefit to appellant's combination, even if this combination were otherwise obvious in view of the Williams and Shine references, the unexpected benefit will overcome the obviousness rejection.

As a result, the Examiner's failure to consider the unexpected result which occurs in the claimed combination of elements, even if taken in view of Williams and Shine, is believed clearly erroneous.

With respect to the subject matter of claim 2, neither Williams nor Shine discloses that at least one of the plies extends across substantially the whole of the sheet element, because neither reference discloses the claimed "composite sheet element."

Neither Williams nor Shine discloses that at least one of the plies in a composite sheet element comprises a plurality of fabric elements as required by claim 3. The specific details of the organization of the plurality of fabric elements in the construction of a ply as set out in claims 4, 5 and 6, all dependent directly from claim 3, is simply not disclosed or even alleged to be disclosed in the Williams and Shine references.

With respect to the subject matter of claim 7, the Examiner has not alleged that either of the Williams or Shine references disclose the use of a main fabric element to confer flexural strength to the seal member, nor the use of a buckle-reduction fabric element as disclosed in claim 8. While Williams contains a disclosure of the use of Teflon on an inner surface of its steel fingers, there is no disclosure in Williams or Shine of the use of a layer of low friction material on the inner surface of the flexible sheet element as set out in claim 9.

The Examiner fails to allege how or where any of the cited references teach a "bulbous lip or bead" as set out in appellant's claim 10. Claim 13 specifies that the fairing arrangement of claim 1 is included in an aircraft wing. Since Williams

clearly fails to disclose the claim 1 fairing arrangement, its disclosure of an aircraft wing structure does not support any rejection of claim 13. Thus, none of the additional limitations set out in the dependent claims are disclosed or rendered obvious by the Williams and/or Shine references.

### **IX. CONCLUSION**

As noted above, neither of the cited prior art references, taken singly or in combination, disclose the claimed elements and the claimed interrelationship between elements as set out in appellant's independent claims. With respect to the combination of references, the Examiner has provided no indication of how or why he believes these references recognize the problem solved by the present invention or contain any suggestion or reason for combining bits and pieces of the references in a hindsight reconstruction. Finally, the Examiner has not disputed appellant's statements of surprising and unexpected result as set out in the specification and, therefore, even if the references were combinable, the unexpected result makes the claims patentable.

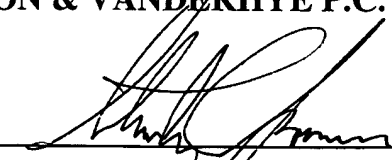
Thus, and in view of the above, the rejection of claims 1-10 and 13-17 over the cited prior art is clearly in error and reversal thereof by this Honorable Board is respectfully requested.

JOHNSON  
Serial No. 09/048,838

Respectfully submitted,

**NIXON & VANDERHYE P.C.**

By: \_\_\_\_\_

  
Stanley C. Spooner  
Reg. No. 27,393

SCS:kmm  
Enclosures  
Appendix A - Claims on Appeal  
Exhibit 1 - *Webster's* page 1028

APPENDIX A

Claims on Appeal

1. A fairing arrangement for bridging an aircraft fixed structure and a control surface hingedly mounted on and angularly displaceable with respect to said aircraft structure, said fairing arrangement including:

a first fairing portion located on said fixed aircraft structure,  
a second fairing portion located on said control surface, and  
an intermediate flexible seal member disposed between said first and second fairing portions and having a proximal edge region fixed relative to one of said first and second fairing portions and a distal edge region,

wherein said flexible seal member comprises a composite sheet element of rubber or rubber-like material incorporating a plurality of reinforcing plies across at least part of said sheet element, each ply comprising one or more fabric elements, whereby the flexible seal member is deformable to accommodate differential movement between said first and second fairing portions and said flexible seal member defines a surface which generally conforms to the adjacent portions of said first and second fairing portions.

2. A fairing arrangement according to Claim 1, wherein at least one of said plies extends across substantially the whole of the sheet element.

3. A fairing arrangement according to Claim 1 wherein at least one of said plies comprises a plurality of fabric elements.

4. A fairing arrangement according to Claim 3, wherein each of said plurality of fabric elements is butted against a neighbouring fabric element in the same ply without significant overlap.

5. A fairing arrangement according to Claim 3 wherein at least one of said plies includes a fabric element comprising a cloth strip element extending along the distal edge region of said flexible sheet element with the axis of maximum tensile strength of said strip element extending generally along the distal edge region.

6. A fairing arrangement according to Claim 3 wherein at least one of said plies includes a fabric element comprising a cloth strip element extending along each of the side regions of the flexible sheet element which extend between said proximal and distal edge regions, with the axis of maximum tensile strength of said cloth strip element extending generally along the associated side edge region.

7. A fairing arrangement according to Claim 1, wherein at least one of said plies comprises a main fabric element extending over at least a central portion of said flexible sheet element to confer flexural strength to said seal member.

8. A fairing arrangement according to Claim 7, wherein said one ply, or at least one of said other plies comprises a buckle-reduction fabric element extending from the proximal edge of said flexible sheet element and of lesser extent than said main fabric element and arranged to prevent or reduce the possibility of the flexible sheet element buckling in that region in use.

9. A fairing arrangement according to Claim 1, wherein at least the distal region of the inner surface of the flexible sheet element comprises a layer of low friction material.

10. A fairing arrangement according to Claim 1, wherein the distal edge of said flexible sheet element includes a bulbous lip or bead.

11. A method of producing a flexible seal member for a fairing arrangement comprises:

providing a tool having a mould surface conforming to the required shape of said flexible seal member,

placing on said mould surface a plurality of reinforcing plies extending across at least a major portion of said mould surface, each ply comprising one or more fabric elements and selected to provide the formed seal member with required flexural and extension characteristics,

impregnating said fabric elements with a curable or rubber or rubber-like material, and

curing said rubber or rubber-like material to provide a composite fabric reinforced seal member.

12. A method according to Claim 11, wherein said fabric elements are impregnated with said rubber or rubber-like material before placing on said mould surface.

13. An aircraft wing including a fairing arrangement according to Claim 1.

14. A fairing arrangement for bridging an aircraft fixed structure and a control surface hingedly mounted on and angularly displaceable with respect to said aircraft structure, said fairing arrangement including:

a first fairing portion located on said fixed aircraft structure,  
a second fairing portion located on said control surface, and  
an intermediate flexible seal member disposed between said first and second fairing portions and having a proximal edge region fixed relative to one of said first and second fairing portions and a distal edge region,

wherein said flexible seal member comprises a composite sheet element of rubber or rubber-like material incorporating a plurality of reinforcing plies across at least part of said sheet element, each ply comprising one or more fabric elements

and at least one ply comprising a plurality of fabric elements, whereby the flexible seal member is deformable to accommodate differential movement between said first and second fairing portions and said flexible seal member defines a surface which generally conforms to the adjacent portions of said first and second fairing portions throughout at least a major extent of the range of said angular displacement of said control surface.

15. A fairing arrangement for bridging an aircraft fixed structure and a control surface hingedly mounted on and angularly displaceable with respect to said aircraft structure, said fairing arrangement including:

- a first fairing portion located on said fixed aircraft structure,
- a second fairing portion located on said control surface, and
- an intermediate flexible seal member disposed between said first and second fairing portions and having a proximal edge region fixed relative to one of said first and second fairing portions and a distal edge region,

wherein said flexible seal member comprises a composite sheet element of rubber or rubber-like material incorporating a plurality of reinforcing plies across at least part of said sheet element, each ply comprising one or more fabric elements and at least one ply comprising a plurality of fabric elements wherein each of said plurality of fabric elements is butted against a neighbouring fabric element in the same ply without significant overlap, whereby the flexible seal member is

deformable to accommodate differential movement between said first and second fairing portions and said flexible seal member defines a surface which generally conforms to the adjacent portions of said first and second fairing portions.

16. In a fairing arrangement for bridging an aircraft fixed structure and a control surface, said fixed structure including a first fairing portion located on said fixed structure, said control surface including a second fairing portion located on said control surface, wherein said improvement comprises an intermediate flexible seal member disposed between said first and second fairing portions and having a proximal edge region fixed relative to one of said first and second fairing portions and a distal edge region adjacent to the other of said first and second fairing portions, wherein said flexible seal member comprises a composite sheet element of at least rubber like material incorporating a plurality of reinforcing plies across at least part of said sheet element, each reinforcing ply comprising one or more fabric elements, whereby the flexible seal member is deformable to accommodate differential movement between said first and second fairing portions and said flexible seal member defines a surface which generally conforms to the adjacent portions of said first and second fairing portions.

17. A flexible seal member for aerodynamically bridging a first fairing portion located on a fixed aircraft structure and a second fairing portion located on

an adjacent moveable aircraft control surface, said flexible seal member

comprising:

a composite sheet element of at least rubber-like material incorporating a plurality of reinforcing plies across at least a portion of said sheet element, each ply comprising one or more fabric elements, whereby said composite sheet element is deformable to conform to accommodate differential movement between said first and second fairing portions while generally conforming to adjacent portions of said first and second fairing portions.

## 1028 royal • rubric

- service (*Royal Air Force*) 2 a: suitable for royalty: MAGNIFICENT b: requiring no exertion: EASY (there is no ~ road to logic —Justus Buchler) 3 a: of superior size, magnitude, or quality (a patronage of ~ dimensions —J. H. Plumb) — often used as an intensive (a ~ pain) b: established or chartered by the crown 4: of, relating to, or being a part (as a mast, sail, or yard) next above the topgallant — *roy-ally* \rōi-ə-lē adv
- royal** n (15c) 1: a person of royal blood 2: a small sail on the royal mast immediately above the topgallant sail 3: a stag of 8 years or more having antlers with at least 12 points
- royal blue** n (1789): a variable color averaging a vivid purplish blue
- royal flush** n (ca. 1868): a straight flush having an ace as the highest card — see *POKER* illustration
- royalism** \rōi-ə-liz-əm n (1793): MONARCHISM
- royalist** \rōi-ə-ləst n (1643) 1 often cap: an adherent of a king or of monarchical government: as a: CAVALIER 3 b: TORY 4 2: a reactionary business tycoon — *royalist* adj
- royal jelly** n (ca. 1855): a highly nutritious secretion of the pharyngeal glands of the honeybee that is fed to the very young larvae in a colony and to all queen larvae
- royal palm** n (ca. 1861): any of several palms (genus *Roystonea*); esp: a tall graceful pinnate-leaved palm (*R. regia*) of southern Florida and Cuba that is widely planted for ornament
- royal poinciana** n (ca. 1900): a showy tropical tree (*Delonix regia* syn. *Poinciana regia*) widely planted for its immense racemes of scarlet and orange flowers — called also *flamboyant*, *peacock flower*
- royal purple** n (1661): a dark reddish purple
- royalty** \rōi-(ə)-lē n, pl. -ties [ME *roialte*, fr. MF *roialté*, fr. OF, fr. *roial*] (14c) 1 a: royal status or power: SOVEREIGNTY b: a right or prerogative of a sovereign (as a percentage paid to the crown of gold or silver taken from mines) 2: regal character or bearing: NOBILITY 3 a: persons of royal lineage b: a person of royal rank (how to address *royalties* —George Santayana) c: a privileged class 4: a right of jurisdiction granted to an individual or corporation by a sovereign 5 a: a share of the product or profit reserved by the grantor esp. of an oil or mining lease b: a payment made to an author or composer for each copy of his work sold or to an inventor for each article sold under a patent
- royster** var of ROISTER
- roz-zer** \rāz-ər n [origin unknown] slang Brit (1893): POLICEMAN
- RPG** \r-(j)pē-jē n [report program generator] (1966): a computer language that generates programs from the user's specifications esp. to produce business reports
- rrha-gia** \rā-j(ē)-ə, -rā-zhə; -rāj-ə, -rāzh-ə n comb form [NL, fr. Gk. fr. *rhēgnynai* to break, burst; akin to OSlav *řezati* to cut]: abnormal or excessive discharge or flow (*metrorrhagia*)
- rrhoea** also -r-rhoea \rē-ə n comb form [ME -ria, fr. LL -rrhoea, fr. Gk. -rrhoia, fr. *rhoia*, fr. *rhein* to flow — more at *STREAM*]: flow: discharge (*logorrhoea*) (*leukorrhoea*)
- rhine** or -rhine \rīn adj comb form [ISV, fr. Gk. -rrhin-, -rrhis, fr. *rhin-*, see *RHIS*]: having (such) a nose (*platyrrhine*)
- rrhiza** — see *RHIZA*
- rRNA** \rā-är-en-ä n (ca. 1965): RIBOSOMAL RNA
- ruana** \rū-ä-nä n [AmerSp. fr. Sp. woolen fabric] (ca. 1903): a woolen covering resembling a poncho
- rub** \rəb vb rubbed; **rub-bing** [ME *rubben*; akin to Icel *rubba* to scrape] vi (14c) 1 a: to move along the surface of a body with pressure: GRATE b (1): to fret or chafe with or as if with friction (2): to cause discontent, irritation, or anger 2: to continue in a situation usu. with slight difficulty (in spite of financial difficulties, he is *rubbing* along) 3: to admit of being rubbed (as for erasure or obliteration) ~ vt 1 a: to subject to or as if to the action of something moving esp. back and forth with pressure and friction b (1): to cause (a body) to move with pressure and friction along a surface (2): to treat in any of various ways by rubbing c: to bring into reciprocal back-and-forth or rotary contact 2: ANNOY, IRRITATE (his attitude tended to ~ her) — **rub elbows** or **rub shoulders**: to associate closely: MINGLE — **rub one's nose in**: to bring forcefully or repeatedly to one's attention — **rub the wrong way**: to arouse the antagonism or displeasure of: IRRITATE
- rub** n (1586) 1 a: an unevenness of surface (as of the ground in lawn bowling) b: OBSTRUCTION, DIFFICULTY (the ~ is that so few of the scholars have any sense of this truth themselves —Benjamin Farrington) c: something grating to the feelings (as a gibe or harsh criticism) d: something that mars serenity 2: the application of friction with pressure (an alcohol ~)
- Rubaiyat stanza** \rū-bē-ät-, -ät-, -bi-, (y)ät-, -(y)ät- n [The *Rubāiyāt* of Omar Khayyām, quatrains translated by Edward Fitzgerald (1859)] (1940): an iambic pentameter quatrain with a rhyme scheme *aaba*
- rub-bas** \rū-bas, -rū-ə n [F *rubace*, irreg. fr. *rubis* ruby — more at *RUBY*] (ca. 1890): a quartz stained a ruby red
- rub-ba-to** \rū-bät-(j)ə n, pl. -tos [It. lit., robbed] (ca. 1883): a fluctuation of speed within a musical phrase typically against a rhythmically steady accompaniment
- rub-ber** \rəb-ər n (1536) 1 a: one that rubs b: an instrument or object (as a rubber eraser) used in rubbing, polishing, scraping, or cleaning c: something that prevents rubbing or chafing 2 [fr. its use in erasers] a: an elastic substance that is obtained by coagulating the milky juice of any of various tropical plants (as of the genera *Hevea* and *Ficus*), is essentially a polymer of isoprene, and is prepared as sheets and then dried — called also *caoutchouc*, *india rubber* b: any of various synthetic rubberlike substances c: natural or synthetic rubber modified by chemical treatment to increase its useful properties (as toughness and resistance to wear) and used esp. in tires, electrical insulation, and waterproof materials 3: something made of or resembling rubber: as a: a rubber overshoe b (1): a rubber tire (2): the set of tires on a vehicle c: a rectangular slab of white rubber in the middle of a baseball infield on which a pitcher stands while pitching d: CONDOM — *rubber* adj
- rubber** n [origin unknown] (1599) 1: a contest consisting of an odd number of games won by the side that takes a majority (as two out of three) 2: an odd game played to determine the winner of a tie
- rubber band** n (1895): a continuous band of rubber used in various ways (as for holding together a sheaf of papers)
- rubber-base paint** n (ca. 1937): a paint having a rubber derivative or a synthetic resin as its binder or vehicle
- rubber bridge** n (1935): a form of contract bridge in which settlement is made at the end of each rubber
- rubber cement** n (ca. 1890): an adhesive consisting typically of a dispersion of vulcanized rubber in an organic solvent
- rubber check** n [fr. its coming back like a bouncing rubber ball] (1926): a check returned by a bank because of insufficient funds in the payer's account
- rub-ber-ize** \rəb-ə-riz vi -ized; -izing (ca. 1908): to coat or impregnate with rubber or a rubber solution
- rub-ber-like** \rəb-ər-lik adj (1944): resembling rubber esp. in physical properties (as elasticity and toughness)
- rub-ber-neck** \rəb-ək vi (1896) 1: to look about, stare, or listen with exaggerated curiosity 2: to go on a tour: SIGHTSEE
- rub-ber-neck-er** \rəb-ək-ər also **rub-ber-neck** \rəb-ək n (ca. 1896) 1: an inquisitive person 2: TOURIST: esp: one on a guided tour
- rubber plant** n (1888): a plant that yields rubber; esp: a tall tropical Asian tree (*Ficus elastica*) frequently dwarfed as an ornamental
- rubber-stamp** vt (1918) 1: to approve, endorse, or dispose of as a matter of routine or at the command of another 2: to mark with a rubber stamp
- rubber stamp** n (1881) 1: a stamp of rubber for making imprints 2 a: a person who echoes or imitates others b: a body or person that approves or endorses a program or policy with little or no dissent or discussion 3 a: a stereotyped copy or expression (the usual *rubber stamps* of criticism —H. L. Mencken) b: a routine endorsement or approval — *rubber-stamp* adj
- rubber tree** n (1847): a tree that yields rubber; esp: a So. American tree (*Hevea brasiliensis*) of the spurge family that is cultivated in plantations and is a chief source of rubber
- rub-bery** \rəb-(ə)-rē adj (1907): resembling rubber (as in elasticity, consistency, or texture) (~ legs)
- rub-bing** \rəb-ɪŋ n (1845): an image of a raised, incised, or textured surface obtained by placing paper over it and rubbing the paper with a colored substance
- rubbing alcohol** n (ca. 1930): a cooling and soothing liquid for external application that contains approximately 70 percent denatured ethyl alcohol or isopropanol
- rub-bish** \rəb-ɪsh, dial. -ij n [ME *robys*] (15c) 1: useless waste or rejected matter: TRASH 2: something that is worthless or nonsensical (few real masterpieces are forgotten and not much ~ survives —William Bridges-Adams) — *rub-bishy* \rəb-ɪʃ adj
- rub-ble** \rəb-əl n [ME *robly*] (15c) 1 a: broken fragments (as of rock) resulting from the decay or destruction of a building (fortifications knocked into ~ —C. S. Forester) b: a miscellaneous confused mass or group of usu. broken or worthless things (lay in a pile of ~, only this time there was more of it, additional gear having hit the deck —K. M. Dodson) 2: waterworn or rough broken stones or bricks used in coarse masonry or in filling courses of walls: also: RUBBLEWORK 3: rough stone as it comes from the quarry
- rub-ble** vi **rub-ble**; **rub-ble** \rəb-əl-ɪŋ (15c): to reduce to rubble
- rub-ble-work** \rəb-əl-wərk n (1823): masonry of stones that are rudely squared or not squared and are irregular in size and shape
- rub-down** \rəb-ə-dān n (1896): a brisk rubbing of the body
- rube** \rūb n [Rube, nickname for Reuben] (1896): an awkward unsophisticated person: RUSTIC
- ru-be-fa-cient** \rū-bə-fā-shənt adj [L. *rube-faciens*, prp. of *rube-facere* to make red, fr. *rubeus* reddish + *facere* to make — more at *RUBY*, DO] (1804): causing redness (as of the skin)
- ru-be-fa-cient** n (1805): a substance for external application that produces redness of the skin
- Rube Goldberg** \rūb-gol(d)-bərg also **Rube Gold-ber-gian** \rū-bə-gē-ən, -bərg-yən adj (Reuben (Rube) L. Goldberg †1970 Am. cartoonist) (1942): accomplishing by complex means what seemingly could be done simply (a kind of *Rube Goldberg* contraption... with five hundred moving parts —L. T. Grant); also: characterized by such complex means
- ru-bel-la** \rū-bel-ə n [NL, fr. L. fem. of *rubellus* reddish, fr. *ruber* red — more at *RED*] (1883): GERMAN MEASLES
- rub-el-lite** \rū-bel-īt, -rū-bā-līt n [L. *rubellus*] (ca. 1796): a red tourmaline used as a gem
- ru-be-o-la** \rū-bē-ō-lə, -rū-bē-ə-lə n [NL, fr. neut. pl. of (assumed) NL *rubeolus* reddish, fr. L. *rubeus* — more at *RUBY*] (1803): MEASLES — *ru-be-o-lar* \rə-lər adj
- Ru-bi-con** \rū-bi-kən n [L. *Rubicon*, *Rubico*, river of northern Italy forming part of the boundary between Cisalpine Gaul and Italy whose crossing by Julius Caesar in 49 B.C. was regarded by the Senate as an act of war] (1626): a bounding or limiting line: esp: one that when crossed commits a person irrevocably
- ru-bi-cund** \rū-bi-(j)kənd adj [L. *rubicundus*, fr. *rubere* to be red; akin to L. *rubeus*] (1503): RUDDY — **ru-bi-cun-dity** \rū-bi-kən-dət-ē n
- ru-bid-i-um** \rū-bid-ē-əm n [NL, fr. L. *rubidus* red, fr. *rubere*] (1861): a soft silvery metallic element that decomposes water with violence and bursts into flame spontaneously in air — see *ELEMENT* table
- rub in** vi (1851): to harp on (as something unpleasant): EMPHASIZE
- rub-i-ous** \rū-bē-əs adj (1601): RED, RUBY
- rub-le** \rū-bəl n [Russ *rubl'*] (1554) — see *MONEY* table
- rub off** \rəb-əf vi (1818): to become transferred (bad habits were *rubbing off* on them) (carbon *rubbs off* on your hands) — *rub-off* \rəb-əf n
- rub out** \rəb-əut vi (1567) 1: to obliterate or extinguish by rubbing 2: to destroy completely: SPECIFY: KILL, MURDER (somebody *rubbed him out*... with a twenty-two —Raymond Chandler) — *rub-out* \rəb-əut n
- ru-bric** \rū-brīk, -brīk n [ME *rubrike* red ocher, heading in red letters of part of a book, fr. MF *rubrique*, fr. L. *rubrica*, fr. *rubr-*, *rubere* red] (14c) 1: a heading of a part of a book or manuscript done or underlined in a color (as red) different from the rest 2 a (1): NAME, TITLE: SPECIFY: the title of a statute (2): something under which a thing is classed: CATEGORY (the sensations falling under the general ~, "pressure" —F. A. Geldard) b: an authoritative rule: esp: a rule for conduct of a liturgical service c: an explanatory or introductory commentary: GLOSS: SPECIFY: an editorial interpolation 3: an established